IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appln. No:	10/766,787
Applicant:	Shaomin Samuel Mo et al.
Filed:	January 28, 2004
Title:	METHOD AND APPARATUS FOR IMPROVING ERROR RATES IN MULTI-BAND ULTRA WIDEBAND COMMUNICATIONS SYSTEMS
TC/A.U.:	2611
Examiner:	Freshteh N. Aghdam
Confirmation No.:	3987
Docket No.:	MATI-238US

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Responsive to the Office Action dated January 9, 2008, please amend the above-identified application as follows:

☐ **Amendments to the Specification** begin on page of this paper.

☒ **Amendments to the Claims** are reflected in the listing of claims which begins on page **2** of this paper.

☐ **Amendments to the Drawings** begin on page of this paper and include an attached replacement sheet(s).

☐ **Amendments to the Abstract** are on page of this paper. A clean version of the Abstract is on page of this paper.

☒ **Remarks/Arguments** begin on page **10** of this paper.

Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Previously Presented) A method for use in a communication system utilizing multiple bands to improve error rates in the transmission of a data stream to a receiver, the method comprising the steps of:

mapping a bit stream within the data stream to the multiple bands in a first band order;

mapping the bit stream to the multiple bands in a second band order that is different than the first band order; and

transmitting the bit stream in the first band order and the bit stream in the second band order for receipt by the receiver.

2. (Currently Amended) The method of claim 1, wherein the method is for use in an Ultra Wideband (UWB) communication system which utilizes a plurality of UWB multi-bands and wherein the transmitting step comprises the steps of:

transmitting the bit stream in the first band order via a first UWB multi-band of the plurality of UWB multi-bands and the bit stream in the second band order via a second UWB multi-band of the plurality of UWB multi-bands.

3. (Currently Amended) The method of claim 1, further comprising the step of:

receiving a received error indicator corresponding to the bit stream in the first band order, wherein the bit stream is mapped to the multiple bands in the second band order and transmitted in the second band order only responsive to receipt of the received error indicator.

4. (Cancelled)

5. (Cancelled)

6. (Currently Amended) The method of claim 1, wherein the bit stream is mapped to the multiple bands in the first band order in a frame time and wherein the step of mapping the bit steam to the multiple bands in the second band order comprises the steps of:

mapping the bit stream to the multiple bands in the second band order in a subsequent frame time to the frame time in which the bit stream is mapped to the multiple bands in the first band order.

7. (Previously Presented) A method for use in a communication system utilizing multiple bands to improve error rates in a data stream received from a transmitter, the transmitter capable of mapping an input bit stream of a data stream to the multiple bands in a first band order and the input bit stream to the multiple bands in a second band order that is different than the first band order, the method comprising the steps of:

receiving a bit stream in the multiple bands during a first transmission and an other bit stream in the multiple bands during a second transmission, the received bit streams corresponding to the input bit stream;

demapping the received bit stream according to the first band order to obtain a first band bit stream corresponding to the input bit stream;

demapping the other bit stream according to the second band order to obtain a second band bit stream corresponding to the input bit stream; and

processing the first and second band bit streams to yield the input bit stream.

8. (Currently Amended) The method of claim 7, wherein the first and second band bit streams each include symbols and wherein the processing step comprises the step of:

combining symbols in the first band bit stream with corresponding symbols in the second band bit stream; and

processing the combined symbols to yield ~~the portion of~~ the input bit stream.

9. (Currently Amended) The method of claim 7, wherein the transmitter is configured to map ~~the portion of~~ the input bit stream to the multiple bands in the second band order responsive to an error detection signal and wherein the method further comprises the steps of:

detecting errors in the first ~~band~~transmission; and

generating the error detection signal for receipt by the transmitter responsive to the detected errors.

10. (Previously Presented) An apparatus for use in a communication system utilizing multiple bands to improve error rates in the transmission of a data stream to a receiver, the apparatus comprising:

a mapper configured to map a bit stream within the data stream to the multiple bands in a first band order and to map the bit stream to the multiple bands in a second band order that is different than the first band order; and

a transmitter coupled to the mapper, the transmitter configured to transmit the bit stream in the first band order and the bit stream in the second band order for receipt by the receiver.

11. (Original) The apparatus of claim 10, wherein the transmitter is an Ultra Wideband (UWB) multi-band transmitter.

12. (Currently Amended) The apparatus of claim 10, wherein the mapper is further configured to receive a received error indicator corresponding to the bit stream mapped to the multiple bands in the first band order and wherein the mapper only maps the bit stream to the multiple bands in the second band order for transmission by the transmitter responsive to receipt of the received error indicator.

13. (Cancelled)

14. (Currently Amended) The apparatus of claim 10, wherein the mapper is configured to map the bit stream to the multiple bands in the first band order in a frame time and to map the bit stream to the multiple bands in the second band order in a subsequent frame time to the frame time in which the bit stream is mapped to the first band order.

15. (Previously Presented) An apparatus for use in a communication system utilizing multiple bands to improve the reception of a data stream from a transmitter, the transmitter capable of mapping an input bit stream of a data stream to the multiple bands in a first band order and the input bit stream to the multiple bands in a second band order that is different than the first band order, the apparatus comprising:

a receiver configured to receive a bit stream corresponding to the input bit stream in the multiple bands during a first transmission and an other bits stream corresponding to the input bit stream in the multiple bands during a second transmission;

a demapper coupled to the receiver, the demapper configured to demap the bit stream according to the first band order to obtain a first band bit stream corresponding to the bit stream and to demap the other bit stream according to the second second band order to obtain a second band bit stream corresponding to the first band bit stream; and

a processor coupled to the demapper, the processor configured to process the first and second band bit streams to yield the input bit stream.

16. (Currently Amended) The apparatus of claim 15, wherein the first and second input bit streams each include symbols and wherein the processor is further configured to combine symbols in the first input bit stream with corresponding symbols in the second input bit stream and to process the first and second input bit streams to yield ~~the portion of~~ the input bit stream.

17. (Currently Amended) The apparatus of claim 16, wherein the transmitter maps the portion of the input bit steam to the multiple bands in the second band order responsive to an error detection signal and wherein the processor is further configured to detect errors in the first ~~band~~ transmission and to generate the error detection signal for receipt by the transmitter responsive to the detected error.

18. (Previously Presented) A system for use in a communication system utilizing multiple bands to improve error rates in the transmission of a data stream to a receiver, the system comprising:

means for mapping a bit stream within the data stream to the multiple bands in a first band order;

means for mapping the bit stream to the multiple bands in a second band order that is different than the first band order; and

means for transmitting the bit stream in the first band order and the bit stream in the second band order for receipt by the receiver.

19. (Currently Amended) The system of claim 18, further comprising:

means for receiving a received error indicator corresponding to the bit stream in the first band order, wherein the bit stream is mapped to the multiple bands in the second band order and transmitted in the second band order only responsive to receipt of the received error indicator.

20. (Previously Presented) A system for use in a communication system utilizing multiple bands to improve error rates in a data stream received from a transmitter, the transmitter capable of mapping an input bit stream of a data stream to the multiple bands in a first band order and the input bit stream to the multiple bands in a second band order that is different than the first band order, the system comprising:

means for receiving a bit stream in the multiple bands during a first transmission and an other bit stream in the multiple bands during a second transmission, the received bit streams corresponding to the input bit stream;

means for demapping the received bit stream according to the first band order to obtain a first band bit stream corresponding to the input bit stream;

means for demapping the other bit stream according to the second band order to obtain a second band bit stream corresponding to input bit stream; and

means for processing the first and second band bit streams to yield the input bit stream.

21. (Currently Amended) The system of claim 20, wherein the means for processing comprises:

means for combining symbols in the first band bit stream with corresponding symbols in the second band bit stream; and

means for processing the combined symbols to yield ~~the portion of~~ the input bit stream.

22. (Currently Amended) The system of claim 21, wherein the transmitter is configured to map ~~the portion of~~ the input bit stream to the multiple bands in the second band order responsive to an error detection signal and wherein the system further comprises:

means for detecting errors in the first ~~band~~transmission; and

means for generating the error detection signal for receipt by the transmitter responsive to the detected errors.

23. (Currently Amended) A tangible computer readable carrier including software that is configured to control a computer to implement a multi-band ultra wideband signal processing method embodied in a computer readable medium to improve error rates in the transmission of a data stream to a receiver, the method including the steps of:

mapping a bit stream within the data stream to the multiple bands in a first band order;

mapping the bit stream to the multiple bands in a second band order that is different than the first band order; and

transmitting the bit stream in the first band order and the bit stream in the second band order for receipt by the receiver.

24. (Currently Amended) The tangible computer readable carrier of claim 23, wherein the method implemented by the computer further includes the step of:

receiving a received error indicator corresponding to the bit stream in the first band order, wherein the bit stream is mapped to the multiple bands in the second band order and transmitted in the second band order only responsive to receipt of the received error indicator.

25. (Currently Amended) A tangible computer readable carrier including software that is configured to control a computer to implement a multi-band ultra wideband signal processing method embodied in a computer readable medium to improve error rates in a data stream received from a transmitter, the transmitter capable of mapping an input bit stream of a data stream to the multiple bands in a first band order and the input bit stream

to the multiple bands in a second band order that is different than the first band order, the processing method including the steps of:

receiving a bit stream in the multiple bands during a first transmission and an other bit stream in the multiple bands during a second transmission, the received bit streams corresponding to the input bit stream;

demapping the received bit stream according to the first band order to obtain a first band bit stream corresponding to the input bit stream;

demapping the other bit stream according to the second band order to obtain a second band bit stream corresponding to the input bit stream; and

processing the first and second band bit streams to yield the input bit stream.

26. (Currently Amended) The tangible computer readable carrier of claim 25, wherein the processing step for implementation by the computer comprises the steps of:

combining symbols in the first band bit stream with corresponding symbols in the second band bit stream; and

processing the combined symbols to yield ~~the portion of~~ the input bit stream.

27. (Currently Amended) The tangible computer readable carrier of claim 26, wherein the transmitter is configured to map the portion of the input bit stream to the multiple bands in the second band order responsive to an error detection signal and wherein the method implemented by the computer further includes the step of:

detecting errors in the first ~~band~~transmission; and

generating the error detection signal for receipt by the transmitter responsive to the detected errors.

28. (New) The method of claim 1, wherein the bit stream is mapped to each of the multiple bands in the first band order and is mapped to each of the multiple bands in the second band order.

29. (New) The system of claim 18, wherein the bit stream is mapped to each of the multiple bands in the first band order and is mapped to each of the multiple bands in the second band order.

30. (New) The tangible computer readable carrier of claim 23, wherein the bit stream is mapped to each of the multiple bands in the first band order and is mapped to each of the multiple bands in the second band order.

31. (New) The method of claim 1, wherein the bit stream is mapped to the multiple bands in the first band order and is mapped to the multiple bands in the second band order without removing one or more bands.

32. (New) The system of claim 18, wherein the bit stream is mapped to the multiple bands in the first band order and is mapped to the multiple bands in the second band order without removing one or more bands.

33. (New) The tangible computer readable carrier of claim 23, wherein the bit stream is mapped to the multiple bands in the first band order and is mapped to the multiple bands in the second band order without removing one or more bands.

Remarks/Arguments:

Claims 1-3, 6-12 and 14-27 are presently pending, with all pending claims rejected. Applicants herein amend claims 2, 3, 6, 8-9, 12, 14, 16, 17, 19, and 21-27 and add claims 28-33. No new matter is added. Applicants respectfully request reconsideration in view of the above amendments and the following remarks.

Request for Interview

Applicants respectfully request a telephonic interview with the Examiner to discuss the amendments and remarks set forth herein. Applicants attempted to arrange a telephonic interview on March 25, 2008, but discovered the Examiner was unavailable until April 14, 2008. Applicants are hopeful the Examiner will grant an interview upon her return.

Claim Objections

Claims 2, 3, 6, 8, 9, 12, 14, 16, 17, 19, 21, 22, 24, 26, and 27 are objected to because of informalities.

Regarding claims 2-3, 6, 8, 9, 12, 14, 17, 19, 21, 22, 24, 26, and 27 the Office Action recites "the phrase 'the first band' and the phrase 'the second band' lack antecedent basis." With respect to claims 8, 21, and 26, the applicants respectfully disagree. These claims each refer to "first band bit streams" and "second band bit streams." Antecedent basis for these phrases are found in the respective independent claim from which these claims depend. Accordingly, applicants respectfully request that the objection to claims 8, 21, and 26 regarding the phrase "the first band" and the phrase "the second band" as lacking antecedent basis be withdrawn. With respect to claims 2-3, 6, 9, 12, 14, 17, 19, 22, 24, and 27, the applicants believe the amendments to these claims remedy the lack of antecedent basis.

Regarding claims 8, 9, 16, 21, 22, and 26, the Office Action recites "the phrase 'the portion of the input bit stream' lacks antecedent basis." Applicants herein amend claims 8, 9, 16, 21, 22, and 26 to remedy the lack of antecedent basis for the phrase "the portion of the input bit stream." Accordingly, applicants respectfully request that the objection to claims 8, 9, 16, 21, 22, and 26 for lack of antecedent basis based on the phrase "the portion of the input bit stream" be withdrawn.

Claim Rejections Under 35 U.S.C. § 101

The Office Action recites that "Claims 23-27 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter." Applicants herein amend claims 23-27 to recite that the computer readable carrier is a "tangible" computer readable carrier. Applicants contend that claims 23-27, as amended, are directed to statutory subject matter and respectfully request that the rejection under 35 U.S.C. § 101 be withdrawn.

Claim Rejections Under 35 U.S.C. § 102

The Office Action recites that "Claims 1, 3, 6-7, 9-10, 12, 14-15, 18-20, and 23-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Gan et al. (US 2006/176850)." Applicants contend that the claims are allowable over Gan et al. (Gan).

Claim 1 includes at least one feature that is not disclosed, taught, or suggested by Gan. Claim 1 is directed to a method for use in a communication system utilizing multiple bands to improve error rates in a transmission of a data stream to a receiver. The method includes the following features:

> mapping a bit stream within the data stream to the multiple bands in a first band order;
>
> mapping the bit stream to the multiple bands in a second band order that is different than the first band order; and
>
> transmitting the bit stream in the first band order and the bit stream in the second band order for receipt by the receiver.

This means that the bit stream within the data stream is mapped to multiple bands in a first band order and that the same bit stream is also mapped to the multiple bands in a second band order that is different than the first band order. The bit stream is then transmitted in both the first band order and the second band order. Thus, the bit stream is mapped to the bands of a multi-band communication system in a first band order and to those same bands of the multi-band communication system in a second band order such that each symbol is mapped to distinct bands. See paragraphs [0031], [0034], and [0035].

The Office Action relies on Gan to teach these features. In particular, the Office Action refers to paragraphs [0056], [0062], [0111], and [0112] of Gan.

Paragraph [0056] of Gan recites:

> A novel approach for managing network communications generally involves selecting sets of communications bands based on **channel performance**. An initial set of channels is selected based on one or more selection criteria at the start-up of the communications network. **Additional sets of channels are then periodically selected to adaptively avoid interference**. (Emphasis added.)

and paragraph [0062] of Gan recites:

> In block 122, a new set of communications channels is selected based on the **channel performance** determined in block 118 in a manner similar to that of block 114 above. For example, the new set of channels may be based on **selecting channels that are good** when the additional testing of block 118 is performed. The new set of channels may be different than the good channels selected in block 112 because new interference typically may be present from other systems that were not being used at the time of the first testing of block 110 or that were not in sufficient proximity at the time of the first testing of block 110 to cause sufficient interference to result in the channels being classified as bad. (Emphasis added.)

These paragraphs indicate that channels are selected for an initial communication and that different channels are selected based on channel performance for a subsequent communication to avoid interference.

Paragraphs [0111] and [0112] of Gan recite:

> According to another embodiment of the invention, a cyclic redundancy check (CRC) is used to test the performance of communications channels. The CRC may be a check of either the payload of the packet or the complete contents of the packet, depending on the communications system protocol being used. As an example, in Bluetooth and IEEE 802.15.1, the data packet must pass a CRC check, otherwise the packet must be retransmitted. **A retransmission request (RR) indicates poor channel performance.**
>
> Use of the CRC approach may be well suited for continuous **monitoring of channel performance**, such as the ongoing monitoring of a selected set of communications channels, because no special packets are required and therefore the overhead is relatively low compared to other approaches that require additional packets. However, the result of each measurement is whether there is a retransmission request or

> not, thus providing limited granularity because a one bit error provides the same result of a lost packet and a multiple bit error. However, as compared to other types of data checks, the CRC provides more bits for testing because either the payload or the entire packet is used to check errors, instead of just a portion of the packet (e.g., just the header for HEC). (Emphasis added.)

These paragraphs indicate that retransmission occurs when poor channel performance is detected and merely provide an indicator of poor channel performance which presumably may be used to avoid selection of those channels for subsequent transmissions as set forth in paragraphs [0056] and [0062]. This is the type of system that is described in the background of the application as originally filed at paragraphs [0005] and [0006]. Thus, Gan describes a system that is unlike the claimed invention as set forth in claim 1 in which a bit stream is mapped to multiple bands in a first band order for one transmission of the bit stream and that bit stream is also mapped to those multiple bands in a second (different) band order for another transmission of the bit stream.

Accordingly, for the reasons discussed above, applicants respectfully submit that Gan fails to disclose, teach, or suggest each and every limitation of claim 1 and, thus, respectfully request that the rejection of claim 1 be withdrawn.

Claims 7, 10, 15, 18, 20, 23, and 25, while not identical to claim 1, include features similar to those found in claim 1. Accordingly, applicants respectfully submit that claims 7, 10, 15, 18, 20, 23, and 25 are allowable for at least the reasons that claim 1 is allowable.

Claims 3, 6, 9, 12, 14, 19, and 24 each depend from one of claims 1, 7, 10, 15, 18, 20, 23, and 25 and, thus, include all the limitations of the respective claim from which it depends. Accordingly, applicants contend that claims 3, 6, 9, 12, 14, 19, and 24 are allowable for at least the reasons set forth above that claims 1, 7, 10, 15, 18, 20, 23, and 25 are allowable. Thus, applicants respectfully request that the rejection of claims 3, 6, 9, 12, 14, 19, and 24 be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

The Office Action recites that "Claims 2 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gan et al, and further in view of Ho (US 2004/0170217)" and that "claims 8, 16-17, 21-22, and 26-27 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Gan et al, and further in view of Son et al (US 2003/0189892)." Claims 2, 8, 11, 16-17, 21-22, and 26-27 each depend from one of claims 1, 7, 15, 20, and 25 and, therefore, include all of the features and limitations of the independent claim from which they depend. The feature that was found to be lacking in Gan with reference to these claims is not found in Ho or Sun; namely, mapping a bit stream to multiple bands in a first band order and mapping that same bit stream to those multiple bands in a second band order. Thus, Ho and Sun fail to make up for the deficiencies of Gan. Accordingly, applicants contend that claims 2, 8, 11, 16-17, 21-22, and 26-27 are allowable and, therefore, respectfully request withdrawal of the rejection of these claims.

Newly Added Claims

Claims 28, 29, and 30 each recite that "the bit stream is mapped to each of the multiple bands in the first band order and is mapped to each of the multiple bands in the second band order" and claims 31, 32, and 33 each recite that "the bit stream is mapped to the multiple bands in the first band order and mapped to the multiple bands in the second band order without removing one or more bands." Applicants contend that none of the references disclose, teach, or suggest these features. Accordingly, applicants respectfully request that newly added claims 28-33 be allowed.

Conclusion

In view of the amendments and remarks set forth above, applicants respectfully submit that claims 1-3, 6-12, and 14-33 are in condition for allowance. Notification to that effect is earnestly solicited.

Respectfully submitted,

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